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East Europe Report

SCIENTIFIC AFFAIRS

No. 689

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HIGHER PRODUCTION OF BS-350 SCANNING ELECTRON MICROSCOPE URGED

Prague ZEMEDELSKE NOVINY in Czech 25 Oct 80 p 3

[Article by Jan Subert: "A Television Transmission From the Realm of the Molecules"]

[Text] The shock which occurred in the world of science in 1677 has not ended--and it is no wonder. The audacity with which the Dutchman Antonius van Leeuwenhoek announced that he had constructed an instrument which overturned the declaration of the Royal Society of Sciences in London that the smallest living animal was the flea, was very revealing. But when Leeuwenhoek, the first man in the world to see protozoa and bacteria, convinced renowned scientists and "anointed heads" with his unprecedented miracle, his "telescope in reverse" had won conclusively, for centuries. The journey in search of the secrets of the invisible world which the Dutch optical microscope launched, and which today culminates in the Czechoslovak scanning instrument, had begun.

But let us remain in history, where the paths of science in search of knowledge sometimes forked or encountered deadends. The first important obstacle to successful penetration into the depths of the microscopic world was put down by modern physics. This happened at the turn of the 19th and 20th centuries, and the new finding was a shock for the microscope from which it was never able to recover. The judgment, against which even the very best glass lens was powerless, was: "The object of observation may not be smaller than one-half the length of a light wave. Light takes no account whatever of particles smaller than 0.0003 millimeters!"

What then? Radiation with a wavelength shorter than that of visible light could be a temporary solution, but scientists prudently reached for the smallest thing available, the electron. And when in 1931 the first electron microscope was built, the journey to the interior of matter--and this time into the realm of molecules--could continue. In all cases, indeed, it was necessary to observe an important condition: the specimen to be studied under the electron microscope must be processed into the form of an extremely thin slab or thick flake of thousandths of a millimeter, otherwise the electrons could not pass through it.

The transmission-type electron microscopes achieved fantastic magnifications, on the order of hundreds of thousands or a million. But they also brought with them problems regarding the sharpness of the image and the inconvenience of looking only at flat samples. Accordingly the scientists' ideal became an instrument which could eliminate these difficulties by means of reflective illumination, and would also make possible direct observation of the surfaces of solid preparations opaque to electrons, which could be prepared with the same ease as specimens for the optical microscope. But was it possible to build such an apparatus?

An affirmative answer is given by the so-called "scanning electron microscope," one of the true miracles of modern science and technology. It does not work on the basis of some new and revolutionary phenomenon, but the cleverness with which it uses the well-known "line principle" of producing a television image is nonetheless admirable.

This time the narrow electron beam neither passes through the specimen nor is directed at one location, but travels across the surface of the object to be studied from one side to the other. Its speed and position are closely matched by another electron beam which is emitted at the same time against the screen. The interaction of the electrons with the surface of the specimen causes these particles to be reflected, but so-called "secondary electrons," photons and other particles, are also produced, and after amplification they affect the brightness of the beam at the viewing screen, where a suitable magnified image of the item being studied is produced.

The technical mastery of this process, which makes it possible to use specimens measured in centimeters and to study parts of them magnified as much as a million times via extremely sharp pictures directly on the screen, is certainly immensely difficult. For example, after the specimen is placed in the microscope, it is frozen and examined in a complete vacuum. For comparison, while the pressure of the air which surrounds us at home, on the street or in nature is able to raise a mercury column about 75 centimeters, in this artificially created vacuum it would reach a height of 0.00001 millimeters. Thus three of the most modern disciplines, ultrahigh vacuum technology, cryogenics and microelectronics, come together in a single instrument.

Thus far only six countries have ventured to produce scanning electron microscopes: The Soviet Union, the United States, Japan, the UK, the Netherlands and Czechoslovakia. And it is even more gratifying that our Czechoslovak instrument is at the absolute summit worldwide in certain of its characteristics. Its capabilities include, for example, that of effecting a direct television transmission from the microscope world and recording it on a video tape recorder. Moreover, it is possible to observe the specimen stereoscopically or to connect a unit for X-ray microscopy and a computer, thus creating an analytic instrument which instantly spews out the precise elementary composition of the specimen in percentages.

The Czechoslovak scanning electron microscope, which is designated the BS-350, was built by the Brno Institute of Instrument Engineering, CSAV, by a team of experts led by the institute head, Corresponding Member of CSAV Armin Delong. The first prototype was produced in 1976, and to date a mere 6 of the devices have seen the light of day in Tesla in Brno, which is in charge of production. In spite of immense interest at home, in CEMA countries and in capitalist countries, where 180,000 dollars has been offered for it, it has thus far been impossible to gear up for more extensive production. Why?

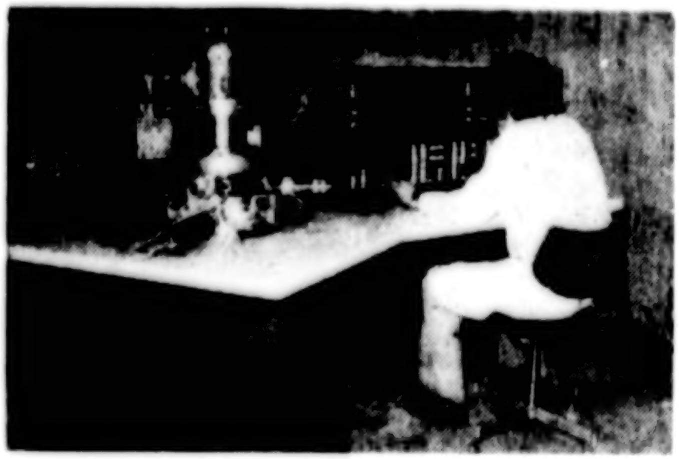
The main problem, according to leading workers in Tesla Brno, is the low labor productivity in one-off production, which is not cost-effective for the enterprise.

But neither would "series" production yield more than a few dozen units a year. It makes no sense to criticize the manufacturer, Corresponding Member A. Delong reminds us. According to him, Tesla is doing everything possible to accommodate the developers of the microscope, but it cannot free itself of the criteria which restrain it.

The same view is held by CSAV Vice Chairman Academician B. Kvasil: "At present we are in a situation where the economic evaluation of enterprises does not support the production of demanding, sophisticated instruments. Labor productivity in these cases is judged by the same criteria as for the production of punches. This approach must be altered quickly."

Information which we have recently acquired indicates, however, that things will only begin to look better for our scanning electron microscope in more extensive production. This should be achieved by means of a so-called "free scientific production association," a firm linkage between the Institute of Instrument Engineering and Tesla Brno, for whose creation the new federal Ministry of the Electronics Industry also has great sympathy.

According to the assurances of Corresponding Member A. Delong, our BS-350 microscope, which is undergoing constant improvement, will be at the world state-of-the-art level for at least 10 years. Accordingly, even allowing for delays, nothing has yet been lost. In the interests of our economy, however, it is necessary to create the conditions which would make possible the entry of the sought-after, sophisticated results of our science into world markets and at the same time would also make possible their utilization at home. The prices of sophisticated instruments are increasing rapidly year after year, and our science cannot do without them if it is to continue moving forward.



[Photo caption] The "handsome" BS-350, which is one of the best instrument engineering products we have ever produced, is at the absolute world summit in some parameters. In addition to direct television transmission, it makes it possible to examine a specimen stereoscopically, and by connecting other apparatus, to convert it into an analytical instrument which instantly spews out the precise percentage elementary composition of the specimen.

8480
CSO: 2402

LONG-RANGE COMPUTER APPLICATION, PRODUCTION DESCRIBED

Warsaw INFORMATYKA in Polish No 9, Sep 80 pp 25-28

[Article: "About Information Science"]

[Text] In Poland information science is an area of growing uncertainty. Although its presence no longer evokes reservations, its achievements are not dazzling. It also turns out that in Poland it frequently is much cheaper to use human labor than to use computers. How, in such a situation, can primitive labor, which exploits man physically, be replaced by modern but very costly computerized information operations?

If decisions to develop information science that is based on the use of increasingly expensive domestic hardware depend exclusively on strict cost effectiveness analysis, then in very many cases the services of computer specialists should have been abandoned. But it is known that such a conclusion is absurd. Many computerized operations can no longer be performed by traditional methods. Information science has brought about fundamental qualitative changes in work methods, and in some work areas it simply cannot be replaced.

Despite development conditions that are not the best, mainly the result of insufficient modern hardware, Polish computer specialists have achieved much. Computers improve management efficiency of most decision links of the national economy; they aid the production control processes in many industrial enterprises, and they increase the effectiveness of scientific, research and development work. The service network of the computer centers of the Information Science Association [ZI] is operating with increasing effectiveness. The gamut of domestically produced computer equipment now includes modern peripheral devices and minicomputers. All in all we now have a potential portending favorable conditions for intensive development of information science.

The need to decrease investment significantly, however, has made it necessary to limit the domestic production and import of computer hardware. Information science is at a critical point because presently planned supplies are not even sufficient to replace worn out hardware. This is a very dangerous trend. Of course, the concern here is not about the specific interests of the over 50,000-strong community of information science people; the concern here is about a fundamental matter--about maintaining Poland in the dynamic stream of modern civilization, about maintaining its status as a member of the community of economically developed countries.

Table 1. The number of computers in Polish computer centers during the 1965–1985 period assuming a 10-year operating period for the computers and that the increase in domestic computer production during the 1981–1985 period will be 50 units annually (during 1981–1982, 20 ODRA 1305 units and 30 R-32 units, and during 1983–1985, 50 R-32 units)

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Total	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Domestic production	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Not long ago Prof Wladyslaw M. Turski wrote (INFORMATYKA, No 1-3/80) that information science methods are a bridge leading to a new stage of development for societies, into a civilization based on information. A country that does not build such a bridge will play a menial role in the future vis a vis important customers. There is no other alternative. With such a rapid development of society (demographic, scientific and so forth), we must utilize the resources of modern information science techniques.

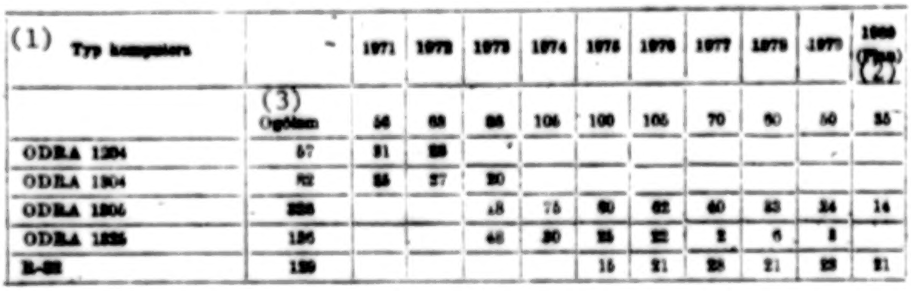
The concern pervading the Polish information science community was one of the motives for calling a plenary meeting on 22 May 1980 of the Chief Technical Organization [NOT] Scientific-Technological Committee on Information Science. Opening the discussion were Dr Janusz Gwiazda, director of the Secretariat of the Committee on Information Science, who delivered the main paper, and Graduate Engineer Zdzislaw Bogdanowicz, director of the Foreign Trade Information Science Center.

These papers and the discussions that followed accented the basis factors hampering the further development of information science. The conclusions will be presented in the form of a document which will include an evaluation of the situation and postulates that the community is addressing to the central authorities. This article is not a formal report of the meeting. Its purpose is to broach the subjects of basic significance for the development of information science in Poland that were discussed at that meeting.

Hardware

Naturally the quantity and quality of computer hardware will decide first of all the results of information science applications. In an extreme situation, the state of things can be such that it would be analogous to "Napoleon's" lack of action.

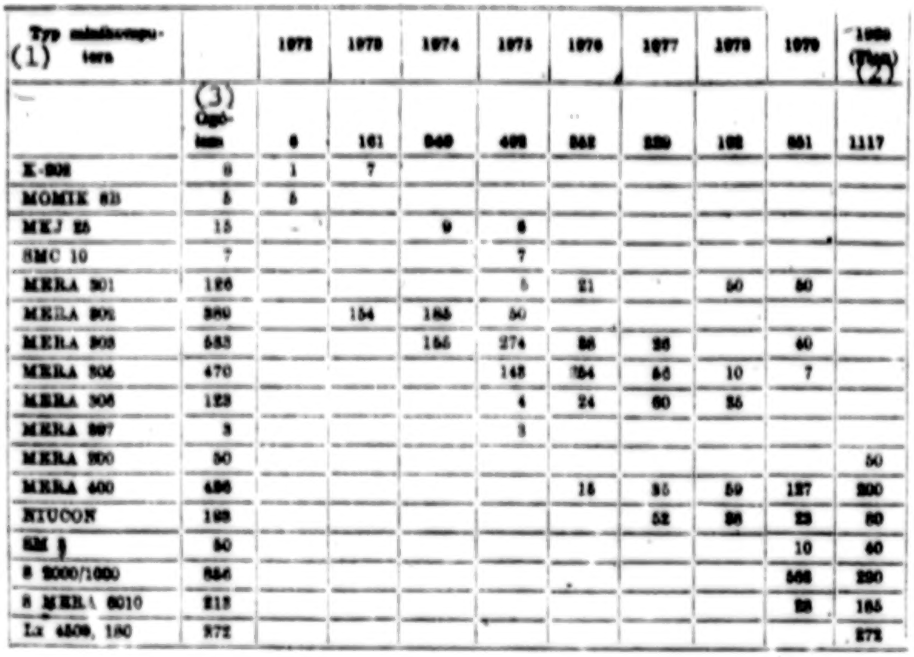
Table 2. Computer production in Poland for the 1971-1980 period



(1) Typ komputera	-	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980 (Plan) (2)
	(3) Ogółem	56	65	[illegible]	106	100	105	70	80	60	35
ODRA 1204	57	31	[illegible]								
ODRA 1304	92	25	37	30							
ODRA 1305	[illegible]			18	75	60	62	60	53	34	14
ODRA 1325	136			48	30	25	22	2	6	1	
R-32	139					15	21	28	21	28	21

Key:
1. Computer type
2. Planned
3. Total

Table 3. Minicomputer production in Poland for the 1972-1980 period



Typ minikomputera (1)		1972	1973	1974	1975	1976	1977	1978	1979	1980 (Plan) (2)
	(3) Ogółem	6	161	360	498	352	238	192	921	1117
K-202	8	1	7							
MOMIK 8B	5	5								
MKJ 25	15			9	6					
SMC 10	7				7					
MERA 301	126				5	21		50	50	
MERA 302	389		154	185	50					
MERA 303	583			166	274	58	25		60	
MERA 305	470				148	234	66	10	7	
MERA 306	123				4	24	60	35		
MERA 307	3				3					
MERA 300	50									50
MERA 400	486					15	35	59	177	200
NIUCON	193						52	38	23	80
SM 3	50								10	40
R 2000/1000	856								566	290
R MERA 9010	213								28	185
Lx 4500, 180	272									272

Key:

1. Minicomputer type 2. Planned 3. Total

The number of computers used in Polish computer centers during the 1965-1985 period is shown in Table 1, which was obtained (as was Tables 2 and 3) from the Foreign Trade Information Science Center. It shows the successive retirement of computers after 10 years of operation and an estimate of the planned number of computers to be produced annually in the next 5-year period for domestic use (50 machines, 15 more than in the current year).*

Table 1 clearly shows the downtrend. There will be fewer and fewer computers. Although the new machines to be introduced will have increasingly greater computing power and their configurations will be more extensive, the quantitative decrease in the next several years, resulting from the necessity to retire many computers, will in effect--as indicated in the discussion--decrease total computing power. Because computer imports over the last several years has been at a minimum, domestic production will determine the extent of supplies. Table 2 shows the number of Polish computers produced during the last decade.

This year's supply of 35 computers will satisfy a little over one-third of the ministries' orders. In the future this disproportion will surely increase since using computerized information methods is simply a necessity defined by principles of the economy. Hindering computerization, especially in the realm of management, can greatly hamper the realization of our economy's main task, namely, to increase efficiency.

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*In light of the increasingly rapid depreciation of computer hardware, especially the drastic price cuts, the assumed 10-year amortization period for computer hardware is now somewhat too long a period from the economic point of view.

Minicomputer production is expanding more dynamically in Poland. The types and number produced during the 1972-1980 period are shown in Table 3. It has been estimated that the disproportions now occurring with medium-size computers are not occurring with minicomputers. However, over the next several years it is expected that the demand for minicomputers and microcomputers will increase sharply. Their export complicates the situation. Some models are not now available for domestic customers and will not be over the next several years.

The intensive export of peripheral equipment also hampers domestic supplies. This popular equipment frequently is not available in Poland. As a result it is getting increasingly difficult to properly complement computers, especially to expand configurations. Of course, such management of peripheral equipment negatively affects current results and further expansion of many applications.

The domestic industry has also mastered the production of some data transmission equipment, such as the 1200-2400 baud modems, interactive and batch terminal equipment and the EC 8371-01 teleprocessing processor. Nonetheless, work on the basic computer network remains far from finished. The expansion and modernization of many computerized information services are a complicating factor.

Increasing the percentage utilization of our computers was the problem most frequently touched upon during the discussion. Presently the average operating period for our computers is 46 percent of calendar time, or 11 hours per day. The main reason, in addition to the lack of precise coordination of computer utilization, is the relatively great unreliability of new domestic hardware, especially during the initial months of operation (INFORMATYKA, No 4/80). It appears--as mentioned with concern during the discussion--that the average time between malfunctions is less than the operating time of a standard program in a given computer center.

The ever increasing shortage of paper, which is needed to feed data into and obtain data from a computer, significantly limits the efficiency of computer operations. Current supplies of paper are often 30-50 percent less than the minimum needs of the computer centers!

Along with the shortage of hardware and operating materials, there is another, no less important problem: the high cost of domestically produced computers. For example, depending on its configuration, the R-32 costs 40-85 million currency zlotys, despite the recent reduction in the prices of the central processing unit. A similar class foreign computer costs much, much less, especially for used models that are being offered in increasing numbers, even if the least advantageous foreign exchange rate is taken into account.

The high price of hardware, which greatly increases the cost of utilizing computers in Poland, is above all--as stated by the representative of the MERA Association of Measuring and Automated Equipment Industry--the result of the technology presently in use in Polish industry. To significantly reduce computer costs it is necessary to use large-scale integration components which are not yet available in Poland. In addition, the average customer's computer equipment is to a great extent obsolete, and planned investment outlays can at most be sufficient only to [illegible] existing technical potential.

The producer is aware of his products high cost and unreliability. He also is aware of the poor service he provides. However, under present circumstances, it is difficult for him to find effective means to improve the situation.

The question then arises: in general is it worthwhile to produce noncompetitive medium-size computers in Poland or would it be better to limit ourselves to narrow specialization in the realm of selected external equipment, minicomputers and microcomputers? The eventual change in our industry's production structure, however, must occur simultaneously with a change in the proportions of computer equipment production, export and import.

Cadres

Total employment in information science is estimated to be 57,000, of which 30 percent are college trained. The level of knowledge and know-how these people have is a fundamental [illegible] (in addition to the amount and quality of hardware) determining the expansion of information science applications.

In accordance [illegible] postulates, during the next 5 years employment will increase by about 10,000 people (about 2,000 per year). It should be noted here that every year about 450 college graduates are information science major. In addition, the technical schools train specialists in related fields, for example, as telecommunications and teleprocessing specialists. In addition to the trade schools, hardware producers and some institutions and associations conduct training in the field of information science on a continuous or sporadic basis. There should be no doubt that the training of new cadres is very important and must keep up with rising demand.

Currently the most important task is to prepare specialists on a long-term basis and not at the level that was current many years ago. This is linked, as it appears, with the reasonable postulate stated by representatives of education that the most modern, foreign computer equipment should be placed at the disposal of the higher schools.

An accurate determination of the structure of future demand for higher educational graduates is an important problem associated with cadre training. Why, for example, increase training of computer designers when, as a result of using integrated circuits of increasing scale of integration, the process of designing computer hardware is becoming simplified? In addition, as I already mentioned, the future of this branch of production is not very optimistic. The realization of detailed accounting of present needs is essential.

Applications

The primary stimulus for information science applications is determined by society's increasing need in this area. Increasing the infrastructure of information science and the number of cadres should be the result of society's awakening needs; it should not be forced by administrative decisions. The further development and extent of applications of information science in Poland in the present situation results more often from existing investment possibilities than from authentic needs. It also is difficult to expect good results from information science applications because the planned computerization of industrial technology or organizational structures precedes information science applications.

Nonetheless, the achievements to date should not be dismissed out of hand. Subsystems incorporated in government systems (SPIS, CENPLAN, PESEL) are already in operation. The first ministerial management systems (for example, in the Ministry of Machine Engineering Industry) as well as many composite element systems and interesting partial solutions have been implemented. Materials management, employment and payroll and accounting systems are used extensively. The number and popularity of very effective programs for scientific and engineering calculations are increasing.

In the last 5 years the applications structure has changed quite markedly. In accordance with current world trends, for example, the share of computerized information methods used to control technological processes increased from 12.5 to 17 percent.

However, the share of applications in the area of services directly affecting social needs (tourism, transportation, trade, postal services, savings banks and so forth) appears to be too small compared to those in the economically developed countries. In Poland information science to date has been applied almost exclusively to meet the external demands of enterprises and institutions.

In the discussion it was stated that one of the most neglected areas of application is the settlement of financial accounts, which is a requisite for the proper functioning of the entire national economy.

One of the observed trends in the world is the continuous decrease in the cost of computerized information services. In consideration of this, ZI published a new price list for its services (INFORMATYKA, No 4/80), lowering existing prices an average of 15 percent. Unfortunately, the high cost of hardware makes it very difficult for other computerized information centers to follow suit.

Coordination

The final item, a matter of fundamental significance, in the list of Poland's information science problems that were touched upon in the discussion is the lack of efficient coordination of its development. Impulsiveness dominates; it outranks plans and guidelines. One gets the impression that no one accepts responsibility in some areas of computerized information. Therefore a new organizational structure must be implemented on a national scale which would protect information science from rigid centralism as well as from decentralized confusion. Timid proposals were presented in this area during the committee meeting.

ZI proposed that the hierarchical system of coordination contain only two levels: central and regional. Central coordination would be carried out by the Committee on Information Science (KI), which was formed in May 1975 by the Council of Ministers, with the Secretariat performing the executive function. The ZI would be responsible for regional coordination, with the local ZETO Electronic Computer Institute (which is most acquainted with the real needs of its region) assuming the role of executory echelon. However, regional coordination should be assumed by an independent institution, one that is not part of interested institutions.

The committee, however disposed toward the function of central coordination, in practice to date has performed as an advisor, having no executory powers. Let us hope that the recent organizational changes in its structure (INFORMATYKA, No 7-8/80) will create a central coordinator by means of a more realistic process.

As soon as possible the committee should publish detailed listings of legal acts, technical standards, and methods of designing systems and software, as well as standardize professional terminology and operating and program-design documentation for systems, and catalogs, as well as classification methods used in information science.

In collaboration with the MERA association, the committee should, among other things, promote the standardization of hardware, the development of effective ways of transferring application software from ODRA computers to Uniform System computers, the designation of methods for creating hierarchical systems based on domestic hardware, and the simplication for the user of the selection of effective hardware configurations.

The committee must also help to resolve the increasingly difficult problem of technical service. The producer himself is unable to do this because--as already explained--the responsible enterprise's value index of output per employee performing service is much less advantageous than for basic production activity. When it is necessary to reduce employment, service personnel are the first to go. In no case, however, should the user organize service internally because from the all-social viewpoint such action is an enormous waste. On the other hand, it would be sensible to create a central service network in the form of a separate enterprise.

An important and urgent task for the immediate years ahead is to create an independent group of experts (perhaps a two-level organization) that would objectively evaluate the preparedness of institutions to implement computerization or the effectiveness of using currently possessed hardware. This would justify decisions regarding the distribution of new hardware. In practice to date there has been a lack of essential objectivism concerning this type of judgment; the special interests of interested parties have always been in the forefront. When distributing hardware, specific preferences for the most important applications should of course be taken into consideration.

Thus the postulate now is: good management and coordination, careful economic analysis before investment decisions are made, a rigorous computer operating mode, avoidance of make-believe fictions (designated mainly for statistics), and treating a computer as an instrument and not as a trump card to upgrade one's own prestige. In other words, information science should be treated as proof and not as a proposition.

Knowledge of the civilizing role that activities in information science play can be of help to people in that field in their battle with today's difficulties. As shown best by the discussion during the meeting, which is the basis of the above reflections, everyone realizes its significance. Most of the problems listed here, which for understandable reasons are very general in nature, do not probe the entire labyrinth of real relationships and interdependencies. In future issues of INFORMATYKA we will attempt to fill out the picture outlined here.

11899
CSO: 2602

CHEMICAL INDUSTRY MINISTER DISCUSSES PAST, FUTURE DEVELOPMENTS

Bucharest REVISTA DE CHIMIE in Romanian No 7, Jul 80 pp 627-631

[Article by Gheorghe Caranfil, minister of the chemical industry]

[Text] Basic Orientations, Priority Goals in the Development of the Chemical Industry

The magnitude of the renewing revolutionary changes that have occurred since the Ninth Congress of the Romanian Communist Party, as well as the complex and comprehensive achievements that have taken place during this time and have fundamentally transformed our entire economic and sociocultural life, will forever be inscribed in gold in our nation's history as the years of the most daring plans and most fulfilling achievements.

The unprecedented achievements obtained during this stage of fertile and prodigious activity bear the imprint of the profound thinking, innovative capabilities, and clear, scientific, and original vision of the secretary general of the party, Nicolae Ceausescu, the communist who has fundamentally reorganized the progress of our society toward the ever higher peaks of multilaterally developed socialism, and who in fact has raised man and his needs to the rank of fundamental objective for the party's entire policy.

The positive and generous effects of this policy have also been ennjoyed by the chemical industry, which during these 15 years has passed through a process of tumultuous renewal and development.

The demands made of the chemical industry have steadily increased with the country's industrialization and the socialist transformation of agriculture. The development levels of the chemical industry have been determined by its role as supplier of raw materials and materials designed to enhance natural resources in all branches of the economy. Its products have been increasingly numerous and diversified, oriented as they were toward agriculture and animal husbandry, machine construction, electronics and electrical machinery, textiles and leathers, the construction materials industry, glass and lumber processing, land, air, and water transportation, printing, and the motion pictures.

During this one and one-half decades, the investment funds allocated to the chemical industry have grown 4.7-fold, with the major effort being directed toward the creation of Romanian petrochemistry as an extremely important branch of the modern chemical industry. New large capacity units have been built, equipped with advanced technology, and most of the existing units have been developed and modernized.

One of the characteristic elements of the Romanian chemical industry is the outstanding growth of industrial production, with a 7-fold increase in the value of its products during the last three five-year plans.

Correlating the requirements for an equitable territorial distribution of chemical plants, with the general needs of the national economy, investments have been directed toward key objectives, thereby assuring the most economic production concurrent with a larger production and higher labor productivity.

During this period we have built new, high capacity chemical fertilizer combines at Piatra-Neamt, Tirgu-Mures, Craiova, Turnu-Magurele, Navodari, Arad, Slobozia, and Bacau; petrochemical combines at the Borzesti-Onesti, Ploiesti, Pitesti, Rimnicu-Vilcea, Teleajen, Midia-Navodari, and Timisoara sites; artificial and synthetic fiber and filament plants at Braila, Savinesti, Iasi, and Roman; enterprises for plastics processing at Bucharest, Buzau, Iasi, and Orastie; the Danubiana tire factory in Bucharest; rubber products enterprises at Bucharest, Pitesti, and Tirgu Jiu; and the pharmaceuticals enterprise in Bucharest.

The more than 1500 capabilities and investment objectives of the chemical industry placed in operation during this period, are an extremely important aspect of the rates and levels increase and achieved by the Romanian chemical industry.

Of particular interest is the fact that production growth rates in the chemical industry exceed those of the investments in this branch, reflecting the increased efficiency of the new objectives, obtained by means of modern technologies and optimum sizing of new production capabilities.

During the last decade, the chemical industry has consistently oriented its development toward a modern production structure, primarily in the sector that derives the highest values from raw materials consistent with the demands of contemporary technical and scientific progress. During this year for instance, petrochemistry -- the most dynamic sector of the branch -- will provide 60 percent of the value of production in the chemical industry, as compared to 45.7 percent during 1975.

The chemical industry has become a factor of general socioeconomic progress, mainly because it lends dynamism to the production of other branches. It provides the products needed by ultimate consumers -- representing 20-25 percent of the value of its production -- as well as those needed by other industrial branches, agriculture, and social life. The products used directly and indirectly by other industrial branches and sectors of activity, and in manufacturing processes specific to them, represent increasingly higher percentages of the industry's production.

The fulfillment of the extremely important tasks entrusted to the chemical industry workers require sustained efforts for planned production to be completed as such.

To an overwhelming degree, this involves the qualitative aspects of activities, the transformation of quantity into a new quality, which as Nicolae Ceausescu has pointed out, constitutes the primordial foundation of the Romanian industry's future, the future of the entire national economy.

It is well known that one of the important criteria for assessing a level of economic development is the volume of physical production. Significant growth has been obtained for the basic products of the chemical industry as compared to 1965. In 1980 for instance, the growth will be 4.4-fold for 100 percent sulfuric acid, 14.5-fold for 100 percent chemical fertilizers, 6.2-fold for chemical fibers and filaments, 10-fold for 100 percent plastic materials and synthetic resins, 11-fold for synthetic rubber, 2.9-fold for tires, 5.5-fold for pharmaceuticals, 7.8-fold for detergents, 2.6-fold for dyes and organic pigments, 4-fold for lacquers and paints, and 8-fold for cosmetics.

The continued diversification and growth in the production of the chemical industry during the last decade and one-half has increased the exportation of products, which by 1979 had increased by more than 22 times over that of 1965.

Profit increases will be derived both from a higher production of goods, and from a considerable reduction in costs per 1000 lei of goods production. It is illustrative that the economic profit forecast for 1980 alone, is 1.6 times higher than the entire value of the goods production achieved in 1966.

In international economic cooperation activities, efforts have been directed toward the production of raw materials and chemical products that are in short supply, assuring long range delivery especially for groups of low tonnage and highly processed products.

New Modernization Concepts -- Achievements, Qualitative Changes

Together with the high rate of physical production, it has been possible to also achieve a significant increase in the exploitation of the country's raw materials and natural resources. The processing of crude oil into petrochemical products has been expanded so as to assure a high economic efficiency for its exploitation; whereas a decade ago these products represented 4.5 percent of the processed crude oil, this year they will represent 10.2 percent, and are expected to amount to about 17 percent in 1965 as a result the pyrolysis of ethane, propane, butane, gasoline, and kerosene, primarily for the production of polymers, synthetic rubbers, synthetic fibers and filaments, and so on.

Low density polyethylene has been used for various types of high strength and high elasticity films used for coverings, printing, cables, injection products, and so on. High density polyethylene has been obtained from the polymerization of ethylene in suspension.

Another direction of development in this sector has been the production of synthetic rubbers. Two installations for the fabrication of polyisoprene rubber were placed in operation during the current five-year plan, one of which produces rubber through stereospecific polymerization of isoprene, a process based on Romanian research. The range of synthetic rubbers is being expanded with new types such as butadiene styrene rubber, polybutadiene rubber, ethylene propylene rubber, and synthetic latexes based on butadiene. Modern installations have also been recently built for separating butadiene from the C_4 fraction through extractive distillation in the presence of selective solvents, to be used in the butadiene rubber installations. Another recent process for increasing the available butadiene, which is currently used industrially, is the oxidehydrogenation of n-butadienes.

The development of the chemical industry and the technologic progress made throughout the world in the field of synthetic and artifical fibers and filaments, fully justifies the development of this production sector in our country. The plant at Savinesti-Neamt has undergone a vast development as a result of the placement in production of three installations for relon-type polyamide fibers, including the production of caprolactame; this plant obtains a wide rage of fibers, such as textile filamentary fibers, textured fibers, cotton-type and wool-type fibers, technologic fibers, cord fibers for tires, and carpet fibers. Future plans include a sustained growth in the production of polyamide fiber and filaments, both through the development of the Savinesti plant, and through the placement in operation of a new plant at Roman during this year.

The production of polyacrylnitrile fibers (Melana) has developed into a range of products through the use of a technology worked out at the Savinesti plant, which uses ethylene carbonate as solvent; because the latter is non-toxic, the process is superior to others of its kind. Since 1969, our chemical industry also produces another class of fibers and filaments -- polyesters (Teron) -- at the Iasi plant, which fabricates cotton and wool-type fibers. This production is expected to grow further through the placement in operation of three new plants for polyester fibers and filaments, presently at an advanced stage of construction at Cimpulung-Muscel, Corabia, and Vaslui. More recently, polypropylene fibers designed primarily for technical applications have also been produced at the Iasi combine.

The powerful development of the chemical fertilizer industry in Romania was determined by two essential considerations: the importance of agriculture as a basic branch of Romania's economy, with its favorable conditions for higher productivity through the use of modern agrochemical techniques, and the reserves of natural gas which could be efficiently exploited as fertilizers.

Ammonia is produced mainly in modern, large capacity installations, built mostly with equipment produced in Romania. Urea production lines have also been standardized. A domestic technology was developed for nitric acid, and modern installations are being built as standard ammonia nitration production lines of 1000 t/day, which can equally well produce nitrated lime at various concentrations. A phosphoric acid manufacturing technology was created for the production of concentrated and complex fertilizers; it uses a dihydrate process suitable for the processing of the most diverse types of phosphates. The production of triple superphosphate and of complex fertilizers based on ammonium phosphate was developed, representing the largest portion of phosphorus fertilizer production.

In inorganic chemistry, electrolysis installations using mercury as well as diaphragm cathodes, have been modernized by replacing graphite anodes with activated titanium anodes, thereby reducing electric power consumption, extending the operating life of cells, and reducing maintenance costs.

The trend of the chemical industry has been to stress the development of the fine synthesis and low tonnage sectors, assigning priority to the development of the pharmaceuticals industry with its particular social implications, since drugs play such an important role in maintaining the health of the population.

The development of pharmaceuticals production in Romania has reflected and continues to reflect the same characteristics and trends found throughout the world, with significant growths in the fabrication of active substances, and especially antibiotics, vitamins, chemotherapeutic products, other substances necessary for the protection of the population's health, livestock support products, and goods for the rapid development and considerable expansion of economic exchanges in world trade. Also notable is the trend to reduce dependence on major producers by reducing the importation of active substances; this has been made possible because the Romanian pharmaceuticals enterprises have developed integrated and comprehensive productions, specializing in therapeutic groups so as to assert themselves on the world market in the respective domains.

The drug production of previous and the current five-year plans also reflect the stages crossed by Romania as a developing nation; the major characteristic of the 1965-1975 period has been the priority development of the pharmaceuticals conditioning sector, which moved from the laboratory phase to the phase of modern, mechanized, and automated industry, and the development of the synthesis of active substances so as to gradually reduce importations.

The current five-year plan has seen a qualitatively superior leap over the preceding five-year plans, insofar as it has achieved priority development in the production of fine and intermediate synthesized active substances.

The industry of cosmetics, perfumes, scents, creams, and lotions, as well as of household and confort chemical products has undergone a considerable growth in recent years, determined by improvements in the quality of life and the demands of human existence.

The production of cosmetics and household chemicals in Romania has been part of the country's dynamic economic development, the objective factors in this growth having been the rapid increase of the population's real income and its level of culture.

The 1970-1975 period saw the creation of the cosmetics industry as a sub-branch of the chemical industry, as well as the transition to a coordinated production in the field of household chemical products.

The development program for the 1976-1980 period foresees a 2.7-fold increase in the value of the production of cosmetic products and household chemicals. The cosmetics and perfume production will increase 2.57 times for an average annual growth rate of 20.5 percent, and the production of household chemical products will increase 3.6 times for an annual rate of 29.6 percent.

During the last decade, the organic synthesis industry underwent a powerful development, complementing the profile of the chemical industry with a wide range of products of practical use in all modern industrial branches, which also satisfy the needs of the market at an increasingly civilized level.

Another outstanding achievement of the organic industry has been the production of a range of alkylamines as intermediate basic products for a number of herbicides and for other organic syntheses. The range of these products will be expanded to enable the continued development of a selection of pesticides for agriculture.

The production of detergents has also grown significantly during the last decade, with older types being replaced by new, biodegradable types. It should be pointed out that all the detergent production technologies were developed by our own research institutes, and that they were constantly updated in industrial installations.

The great accomplishments of the chemical sector during the last 15 years, the most brilliant ones in the entire history of Romania's economy, were made possible by the effective and efficient support of scientific and technical research. The Central Institute for Chemical Research (ICECHIM) was founded in 1970, to group all departmental research institutes, research centers and laboratories of centrals and combines, as well as the research activity in higher education institutes and schools. This organization, based on a modern scientific concept, was established under the direct leadership of academy member, doctor-engineer Elena Ceausescu, and has sought to coordinate all the scientific research in Romania and to concentrate its forces on all the major problems of this research.

The technical research at all the experimental installations operating within large chemical plants has been placed under the jurisdiction of the Central Institute, leading to the integration of chemical research in industrial activities.

As a result of the great efforts made to organize and develop the research and design sector, as well as of the direct guidance and special attention devoted by the party and state leadership to this sector, most of the current production in the chemical industry is obtained in installations designed on the basis of research pursued in our country, particularly in plastics, synthetic rubbers, fertilizers, pesticides, pharmaceuticals, detergents, dyes, and chloro-sodium products, all of them decisive areas for assuring material and technical progress in industrial and agricultural production.

The research units in the chemical industry and in specialized higher education have made outstanding contributions to the achievements and development of the petrochemical industry. This has assured technologies for all monomers and basic products, such as ethylene, ethylene oxide, ethylbenzene, styrene, propylene, propene oxide, glycols, acrylonitrile, vinyl chloride, phenol, acetone, butadiene, formaldehyde, vinyl acetate, and so on.

The existence of these products assures continued development in the production of plastics and synthetic resins, synthetic fibers and filaments, synthetic rubbers, and low-tonnage specialized products for other industries.

The manufacture of synthetic rubbers is a most important domain for the entire economy. With this in mind, outstanding achievements have been made by the research collective of ICECHIM, led by Elena Ceausescu, in obtaining stereospecific elastomers and in solving theoretical problems in kinetics and synthesis, fundamental research problems that have opened a wide horizon for creating new types of elastomers, preparing and purifying monomers, synthesizing specific catalysts, studying structures and relating them to physical-mechanical properties of polymers, establishing methods for stabilizing the polymers obtained, and so on.

Another of ICECHIM's concerns has been the production of the ethylene-propylene copolymer, rubber which has become popular throughout the world because of its numerous applications. These types of synthesized polymers have properties similar to those available throughout the world, and the technology adopted is at the level of the best ones known in industrially developed nations.

In the plastic materials sector, ICECHIM and the research collective of Borzesti have tested and perfected technologic processes for obtaining general purpose polystyrene, using larger capacity reactors.

One outstanding achievement is the development of grafted shockproof polystyrene, and of a technology which will be industrialized in a large capacity installation.

ICECHIM has also succeeded in synthesizing biphenol from phenol and acetone. An industrial installation for biphenol was recently placed in operation using solely domestic raw materials and ancillary products. Biphenol is important as the major intermediate ingredient in the manufacture of epoxy resins, polycarbonates, phenoxyl resins, antioxidants for synthetic rubber, and so on.

In the chemical fertilizer area, work has been done to obtain new types of organomineral products which in addition to nitrogen, phosphorus, and potassium, also contain natural and synthetic macromolecular organic substances. Tests have shown these products to be superior to mineral fertilizers. Other types of fertilizers -- foliar ones -- are offered in liquid form, and in addition to nitrogen, phosphorus, and potassium, contain a wide range of microelements (Ca, S, Zn, Fe, Cu, Mo, B) in the form of complex salts.

Part of the contribution of scientific research to the development of the chemical industry has been the concern for reducing energy consumption, and for economizing energy intensive raw materials. Research in this direction has been oriented toward improving existing technologies, or replacing older ones with modern approaches.

Particular attention has been devoted to research in the most advanced fields of chemical technology -- industrial microbiology, molecular stereochemistry, and the chemistry of fine synthesis to obtain high purity and semiconductor materials.

During this time, the chemical industry has consistently oriented its development toward a modern production structure, primarily in sectors which return the highest value from raw materials, in accordance with the demands of modern technical and scientific progress. This explains the large effort made in pharmaceuticals, dyes, cosmetics, intermediate materials, pure and extra pure metals, all of which significantly increase economic efficiency.

The rate of development of the chemical industry has also imposed the adoption of modern technologies and the perfection of existing ones so as to increase economic efficiency.

Keeping in mind the progress achieved throughout the world, high capability installations have been built using modern technologies. In order to reduce the importation of technologies and to increase domestic contribution to the completion of the development program, efforts have been made to organize and develop the research and design sector aimed at creating Romanian processes. As a result, the production of pharmaceuticals, pesticides, and dyes was developed entirely on the basis of domestic research.

Programs have been formulated for the complex exploitation of raw materials, and recoverable or reusable materials are increasingly being utilized.

This information indicates that the chemical, petroleum, and petrochemical industry is making rapid strides in technical improvements, consistenly using new and modern technologic processes in which research, design, and chemical engineering play a decisive role.

New Requirements for Modernizing Production and Increasing Efficiency

The workshops recently held in Bucharest with responsible groups in the economy, are part of the systematic and constant concern of the party and state leadership to find the most appropriate solutions to the problems that are facing our society in its upward path, for the efficient exploitation of the entire material and human potential available to it. In his extensive speeches, Nicolae Ceausescu has undertaken a profound analysis of some of the fundamental problems in economic activities, and of the growing role of party and state organs in managing the entire society and in the achievement of the plan in industry, agriculture, and other economic sectors. In the spirit of a high sense of responsibility toward the destiny of the country and his own communist drive, starting with the shortcomings that have arisen during this period, the secretary general has established a number of concrete tasks, the major directions for action, the paths to be followed, and practical solutions for improving activities, so as to rigorously achieve economic and social objectives.

Those of us who work in the chemical industry have enjoyed the constant personal guidance and support of Nicolae Ceausescu, at last year's workshop with the ministry's Management Council, during the visits he made to industrial and research units, as well as on the occasion of the frequent analyses he conducted of the most important aspects of our activities.

Following these contacts, all workers in the chemical industry have moved to obtain greater value from material and financial means, and to increase the efficiency of production, investments, and exports. These occasions have also strengthened our confidence in our ability to overcome the difficulties and hardships with which we were confronted.

During this period, the Ministry of the Chemical Industry has conducted an intensive activity to fulfill the provisions of the 1976-1980 five-year plan, the decisions of the 12th Congress, and the decisions and guidelines offered by the party and state leadership.

Given the vast investment program allocated with priority to the chemical industry during the current five-year plan, and which will continue to be allocated in the future, as well as the efforts made to increase labor productivity at existing facilities, the next five-year plan will achieve an average rate of growth of 10.9 percent for net production, 9.8 percent for total production, and 15-22 percent for product groups with extensive processing. The physical production provisions will assure 95 percent of the domestic demand for major product groups, and the production per inhabitant will equal that of developed nations.

The higher value of chemical products per ton of raw material, reduced energy consumption, and the assurance of an average rate of growth of 6.2 percent for labor productivity, will reduce total and material costs in 1985 by 10 percent with respect to 1980.

In order to complete fully and on schedule the comprehensive tasks assigned to the chemical industry for this year and for the future, and in the light of the indications given by the secretary general at the workshop devoted to activity improvements, a special program has been formulated to concentrate the workers' efforts on the following priorities:

Assure the continued operation of current installations at planned parameters, especially in petrochemistry, fertilizers, and basic inorganics, by strictly respecting technical discipline, general maintenance, and periodic repairs. The goal will be to manufacture the necessary spare parts primarily in units of the Ministry of the Chemical Industry, with only specific items to be provided by the Ministry of the Machine Construction Industry;

Hasten the placement in operation of investment plan installations, by assigning priorities according to current project status, preparing investments for the next five-year plan on time, and giving urgent priority to the 1981-1982 period;

Reanalyze installations in terms of energy and fuel consumption, so as to massively reduce these consumptions, and invest new funds to increase the proportion of products that are highly processed and consume little energy, such as pharmaceuticals, cosmetics, low tonnage products, dyes, lacquers and paints, and chemical reagents;

Expand the standardization of installations and equipment in the chemical industry, together with a more extensive introduction and use of domestic research, original Romanian processes, and standardization of chemical products, so as to reduce production costs and rationalize the use of chemical products in all branches of the economy;

Fully and totally use secondary products;

Eliminate accidental shutdowns and assure the continued operation of installations through reinstruction and verification of workers' training. Insistence will be placed on strict respect of technical discipline and manufacturing parameters;

Significantly increase labor productivity through expanded mechanization and automation of manufacturing processes, while raising the level of professional qualification.

The application of the objectives planned for the next five-year plan and for the future will determine the progress of all areas of socioeconomic life. During the ninth decade therefore, the chemical industry will find itself quantitatively and qualitatively at the level of economically developed nations. Thus will this branch contribute more fully to the fact that by 1985 Romania will move beyond the stage of developing nation, and to the fulfillment of our order's supreme goal, the radical improvement of the entire nation's living, material, and cultural conditions.

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DEVELOPMENT OF NONFERROUS, RARE METALS METALLURGY STUDIED

Bucharest METALURGIA in Romanian No 5, May 80 pp 263-265

[Article by Prof Fl. Oprea, Polytechnic Institute, Bucharest]

[Text] Characterization of Technologies for Obtaining Conventional Nonferrous Metals

The growing demand for nonferrous and rare metals, and the nature of domestic raw materials, has imposed the need for improvements and constant adaptations of the technologies used to obtain nonferrous metals and alloys. At the Copsa Mica Metallurgical Enterprise for instance, as part of the ISP (Institute for Studies and Design) process, air is preheated to 1000 °C by means of a heat exchanger in which the purified furnace gas is burned together with another fuel, thereby increasing the melting intensity by about 20-25 percent. At IMMN (Metallurgical Enterprise for Nonferrous Metals) Baia Mare, improvements made to the suspension melting process (charge preparation and homogeneization, higher air preheating temperature, and so on) have increased the melting oven capacity by about 15 percent, and much higher productivities are currently expected from the use of oxygen-enriched air.

More than 10 types of fluxes for formulating and modifying special aluminum alloys have been devised at the Slatina plants, and the possibility of automatic quenching of anodic effects has been verified industrially. The Laromet and Neferal plants in Bucharest have introduced high-strength bronzes containing aluminum, used in truck construction, and deformable bronzes used in the production of 4000 hp engines; they have also established a technology for manufacturing the Cunial alloy (for casting ship propellers) and the Cu-Ag alloy needed to fabricate crystallizers for continuous steel casting installations.

The development of nonferrous metallurgy has therefore been strongly influenced by the nature of the available raw materials, because the growing demand for nonferrous metals and alloys has imposed a comprehensive utilization of all valuable components.

Romania's raw materials base for the production of the major heavy nonferrous metals -- Pb, Cu, Zn, Au, Ag -- consists of ore concentrates of these metals, these concentrates being the finished products of the nonferrous mining sector. For instance, low grade sulfurous copper ores will be increasingly used, since modern technology makes it possible (with higher investments) to exploit ores with up to

Table 1. Increase in the proportion of low grade concentrates over high grade concentrates in the metallurgy of Pb and Zn.

Types of concentrates	1970	1971	1973	1975
Sum of selective Pb and Zn concentrates and of higher grade collective Pb-Zn concentrates (%)	100	100	100	100
Sum of Pb-Zn concentrates contaminated with Cu and Fe (low grade complex concentrates) (%)	26.0	45.6	56.3	64.0

0.50 percent copper content. The major mineral content of these ores is chalcopyrite ($CuFeS_2$), often associated with chalcocite (Cu_2S), with lead, iron, and zinc compounds, as well as with gold and silver. The ore is floated, obtaining sulfurous concentrates which are processed metallurgically.

The silver present in these ores is found in the native state or alloyed with other metals (Au, Pt, Cu, Hg), and as sulfates: argentite (Ag_2S), proustite ($Ag_3As_2S_3$). In the Baia Mare region, polymetallic ores contain Cu, Pb, Sb, Au, and so on. In these ores, gold is found in a native state and in the form of combinations (with pyrite and chalcopyrite, and more seldom with blende or galena). Similarly, gold is found in polymetallic ores as well as in combinations, as selenides and tellurides. Gold is separated from alluvials by washing, and from native ores or from silver by amalgamation (dissolution in Hg) or cyanuration (dissolution in cyanides); from polymetallic ores or in gold combinations, this element is extracted by pyrometallurgic processes, followed by liquation and electrolysis.

Given the chemical composition of Romania's nonferrous metal ores (complex compounds of lead, copper, and zinc sulfates, with sometimes remarkable impurities of Sb, Bi, and As) and their physical and chemical-mineralogical properties, the quality of nonferrous metal concentrates produced by the mining sector and currently processed by the chemical-metallurgical sector, is different from that of concentrates obtained elsewhere. If to this specific aspect of our concentrates we add the large amount of auriferous pyrites which must be processed to extract gold (in combination with lead or copper concentrates the pyrites generate large quantities of slag), we can understand the particular technology and the different extraction yield obtained for Pb and Cu in Romania as compared with other countries.

For the optimum exploitation of the metal contained in ores, the selection of new metallurgical processing technologies has attempted to create for the mining sector, conditions for achieving superior extraction yields as early as the ore preparation phase, by changing from selective flotation to collective flotation for some ores (Ruschita, Baia de Aries, Baita-Craciunesti-Muncelu). From a quantitative standpoint, a higher production of heavy nonferrous metals will be achieved in Romania through the exploitation and processing of complex deposits such as the one at Lesul Ursului, whose mineralogical characteristics are unique in the world, the [illegible] deposit of Rosia-Poieni, or the one in Banat at Moldova Noua. For this reason, the proportion of complex concentrates obtained from ores of the Lesul Ursului type in recent years has been increasingly large. Table 1 shows the relative increase during the 1970-1975 five-year plan, in the production of lead-zinc collective concentrates containing copper and iron, as compared to the cumulative production of selective concentrates of lead, zinc and higher grades of Pb-Zn collective concentrates (Pb+Zn, 55 percent).

Table 2. Chemical composition of pyrite ashes and of the iron ore which can be obtained from their processing.

Material	Average chemical composition (%)						Mechanical resistance kg/pellet
	Fe	Cu	Pb	Zn	As	S	
Pyrite ashes	55	0.8	1	1.8	0.3	2.1	
Iron ore (pellets) from processed ash	57	0.04	0.03	0.03	0.03	0.04	100-150

The final processing technology for such concentrates must take into account the simultaneous presence of the three useful elements (Cu, Pb, Zn), which behave differently in physico-chemical processes, and of iron, which is a particularly troublesome impurity. The new technology must make it possible to directly obtain zinc and copper as metals of first extraction, as well as a copper matte. Industrial tests conducted at the melting installation of Copsa Mica ISP, have shown that the lower grade of complex concentrate requires special conditions in the furnace because the risk exists of not collecting the copper in the form of matte, while forming large quantities of slag which greatly reduce the extraction yields of all three metals.

Currently, these concentrates will be processed by melting in furnaces with short baths. Because this technology also has the drawback of producing Pb and Zn in the form of oxides, which imposes intermediate steps for processing the oxides into metals, research must be continued in Romania to perfect a technology which will assure the extraction of the three metals (Cu, Pb, Zn) from complex concentrates of the Lesul Ursului type, at superior levels and with the lowest possible costs.

Another source for expanding the base of domestic raw materials for the production of zinc, lead, copper, and other elements, is the pyrite ashes stored in the slag heaps of H_2SO_4 plants, and those that are being formed from current production. The processing of 500,000 t of pyrite ashes per year alone, will yield about 6000 t of nonferrous metals and about 450,000 t of iron ore (in pellet form) for steel production. The optimum technology for utilizing these materials had to take into consideration the particular physical characteristics of Romanian pyrite ashes: very fine granulation and high arsenic content.

Because the majority of the metals exploitable from pyrite ashes are in short supply in the national economy, and because their importation raises problems of currency and of foreign sources of supply, the processing of pyrite ashes was particularly essential. The new Turnu Magurele plant handles these materials by the Kow-Seiko Japanese process, which consists of treating the ashes with $CaCl_2$ and calcinating them to volatilize As and nonferrous metals in the form of chlorides (which are subsequently processed hydrometallurgically), while the residue is agglomerated to be used in steel manufacturing. Table 2 shows the chemical composition of pyrite ashes and of the iron ore in pellet form, which can be obtained from these materials.

Also in order to increase the base of raw materials in the production of lead, zinc, and copper, it is necessary to process the slags stored and currently being formed at ISP melting installations, since they contain significant amounts of useful and exploitable materials. The current stage of research in this domain, for slag flotation and electrothermal melting, or for the Fuming process, indicates the possibility of future investments.

Because these slags are stored above ground, and because their Zn+Pb content (8-9 percent) is higher than that of the same metals in ores, they present economic processing opportunities.

Aluminum is the metal whose production in Romania during the 1970-1980 period increased most rapidly. This development of aluminum metallurgy in Romania implies exceptional tasks to assure the raw materials base.

Bauxite is currently processed at the Oradea plant and at a larger, modern plant in Tulcea, which takes advantage of sea and river transportation. Both plants use the Bayer process, which requires bauxite with a maximum content of 5-8 percent SiO_2 (or $\eta_{SiO_2} \geq 10$, where $\eta_{SiO_2} = Al_2O_3/SiO_2$).

During the last world war, aluminum was obtained in Romania only at two insignificant installations in Tirnaveni and Bucharest. After the energy base was assured, it was possible to begin the construction of a large and modern aluminum plant at Slatina, where diverse aluminum products are extracted and processed. The aluminum production meets the domestic consumption demand and provides a certain amount for exportation.

Since aluminum production will intensify in the future, and since the countries that have bauxite deposits (primarily emerging nations) tend to do their own alumina extraction and processing into primary aluminum, problems associated with the raw materials will become more acute. Under these conditions, efforts will be made to use poorer quality bauxite and other materials with a lower Al_2O_3 content than that of bauxite: ashes from thermal generation plants, bituminous shale, nephelines, and so on. Research to exploit our own raw materials must therefore continue at the Oradea plant, which operates an installation to study processing technologies for raw materials with low alumina content, in order to establish design parameters for new industrial installations which will process non-bauxite materials by the end of the present five-year plan.

Extraction of Rare and Scattered Materials

The production of rare metals in Romania has grown significantly during recent years, and their level of recovery from base metal subproducts is satisfactory; the major metals produced at the end of the 1975-1980 five-year plan are: Mn, Mo, Bi, Sb, Cd, In, Se, Te, V, Ge, and Ga.

Industrial level research conducted at IMMN in Copsa Mica, has made it possible to double the amount of technical cadmium produced through recovery from the water used to wash [illegible] gases, and from the electrical filter in the agglomeration department at the ISP installation.

IMMN in Baia Mare is operating an industrial phase of a technique for processing volatile dusts resulting from the copper concentrate suspension-melting installation, which will also significantly increase the production of cadmium, indium, and selenium.

In order to diversify production and to satisfy the growing demand of other industrial branches for rare metals, special alloys of rare metals, semiconductors, and materials which are currently in short supply, research has been conducted with domestic raw materials; future organization has been outlined for a large production of rare metals such as germanium, silicon, indium, and Sn-Sb, In-Sb, In-Al-Ga, and other alloys of semiconductor purity; and plans are being drawn for a new industrial enterprise for ultrapure metals, a new department for the production of high purity selenium and tellurium, a department for the comprehensive utilization of scattered rare materials (In, Ge, Tl, Cd) and the exploitation of Bi and Sb, as well as a department for obtaining lithium and and lithium salts.

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FIRST ELECTRIC DRILLING INSTALLATION MANUFACTURED

Bucharest STIINTA SI TEHNICA in Romanian No 6, Jun 80 p 6

[Article by C. Nedelcu, "F-200EC, the First Romanian Drilling Installation with an Electrical Drive"]

[Text] The installation helps to improve the performance in the following fields: reduction of specific consumption per unit length drilled; increase of the rate of drilling; reduction of physical stresses; raising of the level of technical safety and reduction of the time needed for assembling, transporting and dismantling of the installation.

We called on Comrade Engineer Valeriu Patrascu, of the staff of the General Directorate of the Petroleum Industry, to describe this type of drilling installation, the design and manufacture of which was motivated in particular by the need to save the conventional fuel (and in particular, the liquid fuel) per unit length drilled; he was kind enough to describe to us some of the principal technical features, and to indicate the economic efficiency of the installation. The following elements were involved in the design of this new type of installation: mounting of the winch on the bridge of the derrick, being able to assemble it on the ground; lifting it by folding; building the elements of the installations in large compact units which can be dismantled for transportation; driving the winch, the rotary table and the pump by means of 850 kW d-c motors, fed by the 600V a-c busbar through three-phase rectifiers, controlled at a complete thyristor bridge.

This is the first domestically designed and manufactured drilling installation, in which electrical devices (diodes, thyristors, etc.) are used to control high-power electric motors; as our interlocutor told us, this achievement is the result of "one of the most important tasks assigned to us by the Twelfth Congress of the Romanian Communist Party, asks us to ensure the rapid development of the supply of raw materials for industry and research, by the inclusion of new products with improved characteristics, by the automation and computerization of the production, by introducing an advanced, new technology into all branches of production, in particular into the extractive industry, in order to reduce markedly the consumption of raw materials and energy.

The electrical supply and drive of the derrick consists of several units which are arranged as follows: a 20/0.990 kV - 2 x 2000 kVA transformer, constructed from prefabricated units; two sled-mounted supply stations for control and adjustment, each of which contains two modules of the driving mechanism of the two 850 kW d-c motors. The equipment of a driving module is mounted in four closets. These devices carry out the following functions: a-c input; a-c d-c converter, including the thyristor-controlled rectifier; the automatic speed control and adjustment of the electric motor; the d-c supply of the electric motors.

In addition, the electrical installation contains also four d-c, type MCF-800 explosion-proof electric motors, with the following characteristics: nominal power - 850 kW; nominal induction voltage - 770 V d-c; nominal induction current - 1200 A and nominal rate of rotation of the winch - 1100 rpm. The drilling winch is driven by two motors, and the other two drive independently a 3 PN-1000 type single-action mud pump. Another item of the electrical system consists of the electric power supply panel for the internal services and lighting of the installation.

The whole installation is controlled and checked centrally by the drilling supervisor from a control bench.

The F-200 EC installation is also provided with instrumentation to determine and control the principal drilling parameters, and with mechanization unit (such as, a device to measure the load at the hook, and the pressure at the scoop, a device to measure the torque at the drill pipe; instrumentation to measure the rate of rotation of the rotary table, and the number of double pump strokes; pneumatic winch for pulling, handling tools and materials on the derrick, a device for screwing the feed pieces).

At the present time, the prototype of the F 200 EC drilling installation operates with excellent results at a depth of 4,000 m at the "Brincoveanu" structure in Dimbovita county. Once this type of installation is approved, it will be possible to start the large-scale manufacture of the F 100, F 125, F 320, F 400, F 500 and F 800 type electrically-driven drilling installations, which present great technical and economic advantages in comparison with the heat-actuated drilling equipment (oil driven combustion motors), specifically, by lowering the fuel usually consumed per unit length drilled by 20 to 30%, increasing of the drilling rate by 10%, and reducing the physical stresses in the drilling equipment.

These new types of electrically driven drilling equipment which may be used at depths down to 4,000 to 10,000 m, is the fruit of the efforts of work collectives consisting of young specialists, including the following:

Elena Lepedatu and Viorel Ghita of the ICPE, Bucharest, Viorel Cristea and Andrei Gheorghe of the IPCUP, Ploiesti, Eugen Chitucea and Paul Stavarache of the ICP "Electroputere" - Craiova, Victor Vilvoi and Victor Caraman of the "1 Mai" Ploiesti.

It is planned that during the next Five Year Plan period (1981-1985) 40% of the total of the drilling installations of the OGAPG will be provided with this type of electric drive. Specifically, the units will be manufactured at the "May 1 Ploiesti", "Electroputere Craiova" plants, and the Baneasa Enterprise for Radio Parts and Semiconductors.

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DEVELOPMENTS IN AERONAUTICS INDUSTRY DESCRIBED

Bucharest STIINTA SI TEHNICA in Romanian No 6, Jun 80 p 15

[Article by Teodor Chirica, Engineer, Technical Director, National Center of the Romanian Aeronautical Industry, Ministry of Machine Building Industry, entitled: "Aeronautics - the leading branch of the machine-building industry"]

[Text] The existence and the stage of development of the aeronautical industry represent one of the fundamental indicators for evaluating the technological level of the economy of a country.

The historic decisions of the twelfth congress of the Romanian Communist Party which include at a prominent place, the directives concerning the economico-social development of Romania during the 1981-1985 Five-Year Plan period, together with long-range forecasts up to 1990, underline the scope of intensive development of the process industry, pointing out the headlong rate of the means of aerial transportation, of the aeronautical industry.

The last fifteen years have been chiseled in the consciousness of all of us who were active in the field of aeronautics as a period of giant economic effort, aimed at creating means of research, design and production, permitting our country to regain the fame that it possessed in this area a few decades ago. This new stage represents the most fruitful period of development of Romanian aviation, filling us with pride, while indicating at the same time, our total commitment.

The aeronautical industry in Romania was relaunched as a branch of the machine construction industry, and was brought to its present level of prominence thanks to the continued concern of our party and state leadership, and the personal interest of Comrade Nicolae Ceausescu.

After its reorganization in 1968, our aeronautical industry started from its modest existing means of production, able to ensure partial repairs of airplanes and motors of the stock of our aircraft industry and a very small-scale production of gliders and light utility planes.

As a result of the thus created situation, the available specialists were brought together in a relatively short time and a college-trained new staff was created with the assistance of the Department of Aeronautics of the Polytechnic Institute of Bucharest, the production capacity was developed and suitably supplied for the efficient manufacture of aircraft, including jet engines and mechanical units for helicopters, in intermediate and large series on the basis of our own design, was started in cooperation with others for export on on the basis of licenses.

This activity was initiated a decade ago with the design and construction of the special-purpose IAR 93/ORAO-type jet engine, carrying a "Viper" motor manufactured under license by Rolls Royce both in Romania and Yugoslavia, in cooperation with the specialized Yugoslav industry.

From the specific and technological viewpoint, the aeronautical industry possesses a foundation worthy of attention: our aerodynamic installations are at the level of those of anybody else in the world; we fabricate and employ aircraft components possessing nonconventional structure, including carbon fiber finish; we are manufacturing hydropneumatic equipment, on-board computers; we are getting ready to produce alloy pieces from romanian titanium, we are producing certain categories of equipment and on-board instrumentation, etc.

The experience of the Romanian aircraft constructors was considerably broadened by cooperating with prestigious foreign firms; for example, we manufactured BAC 1-11 aircraft components for the British Aerospace Company, about which the Director of Manufacture of BAC, Peter Renson, stated: "the units manufactured in Romania, even the items difficult to fabricate, such as the stabilizer, cannot be distinguished from those manufactured in England (Flight International, March 15, 1980). The license constracts with SNIAS for jet helicopters, and with Turbomeca (for motors) and the numerous general aviation Pilatus Britten-Norman "Islander" airplanes manufactured in Romania, have a similar implication; the very high construction rate of the Soviet trainer IAK-52, on the basis of a long-range cooperative agreement is another example of this.

A cursory examination of the long-range plans of the Romanian aeronautical industry reveals the following: in the first place, the rate of manufacture of all products - civilian and military aircraft, their motors and other equipment, will be increased specifically by improving the labor efficiency, while making sure that the quality needed for flight safety is safeguarded; in the second place, the production capacity will be developed and the technological preparations for the manufacture of new types of aircraft, including the intermediate range airplane BAC 1-11, and its motor Spay 512, in cooperation with the British Aerospace and Rolls Royce Companies, will be completed, enhancing the degree of integration of the products by incorporating into our own manufacturing schedule a wide range of devices for aircraft systems and motors, of half-finished high-precision cast and forged products; in the third place, a highest level specialized production and research facility will be established on the basis of the Baneasa aircraft industry, fulfilling the long-range concepts of the president of our country, Comrade Nicolae Ceausescu. Having opened up for ever the gate for collaboration, our aeronautical industry, in addition to the acquisition of specialized top-level products and technologies, will continue to extend its export of aeronautical products.

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ROMANIA

DEVELOPMENTS IN COMPUTER INDUSTRY

Systems Reviewed

Bucharest STIINTA SI TEHNICA in Romanian No 7, Jul 80 pp 19-21

[Article by Dr Engineer Emil Tudor, deputy scientific director of the Research Center for Computer equipment: "Computer Technology: A Field in Full Development"]

[Text] Necessity and Possibilities

The encounter with the electronic computer occurred after World War II. It is a lasting encounter, with extensive socioeconomic implications, and it is far from evident in all its aspects. The future will be characterized even more strikingly by the potentials of the electronic computer, especially in controlling the production processes.

The problems that man can no longer solve by traditional means, either because they are too complex or because it would take far too long to solve them, are handled by the means and methods of computer technology. Electronic computers' precision, operating speed and capacity to process a huge volume of data provide man with an immense power to resolve his scientific, economic and industrial problems.

Any rational activity is conducted according to a model, which determines the data of the problem, the operations performed, and the ways of checking the results. The model consists of a series of elementary operations which, in the form of a succession of orders peculiar to a given type of computer, constitute the computer program.

The computer's performances in solving problems according to the program are vast. The processing unit performs hundreds of thousands and even millions of operations per second, the accessory equipment introduces and extracts data with thousands and tens of thousands of characters per second, and the capacity of the external memory units reaches millions and billions of characters. For example, the average speed of the Romanian FELIX C-256 computer is about 170,000 operations per second, while that of the FELIX C-512 computer comes to 300,000 operations per second. The advantage of electronic computers in solving problems requiring a huge number of operations is self-evident.

In its evolution, computer technology first pervaded the field of scientific research and then reached the economic and industrial units. In its present stage it is a feature of people's daily lives, thanks to technological progress in the field of components and manufacture of integrated circuits on a very large scale and microprocessors. Pocket calculators that are much more accurate and convenient than slide rules are being profuced, as well as household appliances like cooking and washing machines controlled by microprocessors. Microcomputers and minicomputers control stoplights and installations for posting train arrivals and departures, record plane reservations, sales and stockpiles in big stores, etc. The possibilities of applying computer technology to all activities are virtually unlimited.

Progress of Computer Technology in Romania

In Romania, the electronic computer industry started in 1968 and showed a very high growth rate. The output of computer equipment was 10 times greater in 1978 than in 1972 and is planned to be 4 times greater this year than in 1975.

The enterprises in the computer industry are producing a varied assortment of computer systems,accessory equipment, and terminals to equip the data processing sectors in all sectors of the national economy.

The computer industry accomplished its tasks by combining international cooperation with development based on Romanian research. In the 1971-1975 period products manufactured with a license predominated, and then the proportion of the output based on Romanian research increased to about 60 percent in the 1977-1980 period.

The products developed by Romanian researchers and assimilated in production have had a number of impressive successes abroad as well. For instance, the INDEPENDENT-100 minicomputer was internationally approved in 1978 under the agreement between several socialist countries concerning minicomputers, and the FC 64 invoicing and accounting machine was awarded the gold medal at the Plovdiv International Trade Fair in 1977.

A wide variety of accessory equipment can be attached to the universal computers of of the FELIX family, in combinations with a great many applications.

The FELIX C-256 medium capacity system and the FELIX C-512-1024 medium-high capacity system operate with 58 Mocteti magnetic disc units, magnetic tape units having 1,600 bpi and a speed of 75 inches per second, card scanners processing 800 cards a minute, rapid printers processing 1,200 lines a minute, teletransmission terminals and other kinds of accessories. The computers have operating systems for multiprogramming, teleprocessing and real time operations.

Two models, the INDEPENDENT-100 and the CORAL-4011, out of the family of Romanian minicomputers have been placed in manufacture. Both types of minicomputer have a modular structure and a wide range of applications. Two operating systems for minicomputers have been developed for this purpose, the adjustable multifunctional system for a disc (AMS) and the real time system (MINOS).

The system for introducing data with a minicomputer (SIDM) was developed to prepare data in the computer centers and to relieve the main machine of a number of incoming-outgoing operations. This equipment makes it possible to introduce data at specialized operating stations and to assemble, check and organize the data in card indexes on magnetic tape with 1,600 bpi. The magnetic tape can then be used for other computers.

The SIV-2400, another device for introducing and verifying data on flexible magnetic discs, permits replacement of card scanners, punches and verifiers. In addition to the processing unit, the device includes an alphabetical-numerical key /tastatura/, a flexible magnetic disc unit, and a printer.

To perform financial-accounting operations, the economy benefits by a complete family of FC 16/32/64/96/128 invoicing and accounting machines developed through Romanian research and manufactured by the Bucharest Electronic Computers Enterprise.

The computer industry also manufactures other kinds of equipment such as posting devices, card scanners, printers, magnetic disc units, magnetic tape units, etc.

Accordingly Romania now has an industrial and research potential in the field of computer technology that can meet all the needs of the national economy.

Prospects

The computer industry is still an extremely dynamic one, and the growing importance of this equipment in all socioeconomic activities is conspicuous. This dynamism is illustrated very well by the sales of microprocessors, which came to about 3 million units in 1978 and are expected to reach about 30 million units in 1982. Since these microprocessors are used in various computer systems and equipment and need accessories, there will be an equally explosive increase in the output of accessory equipment.

The microprocessors and widely integrated circuits permit decentralization of the computing power and its distribution where needed, resulting in changes in the design and organization of the data processing systems that modify the technical-economic requirements for the processing units and the accessory equipment. The new systems and equipment for small-scale data processing must be better adjusted to the concept of distributed data processing.

Applications are increasing to a very great extent. It is estimated that there are over 25,000 of them. This inevitably leads to greater efforts to develop programs for the new systems and applications.

Notable progress is expected of the industrial robots, which will take over man's laborious and dangerous tasks. This progress is based upon microminiaturization and advances in computer technology.

Incorporating in a small space memories, microprocessors for performing several operations, optical scanning organs, and sensors for recognizing objects, the robots weld, paint, assemble machine parts with great precision and replace human labor in the production processes that require higher qualifications.

In most countries development of computer equipment is controlled by national programs. In Romania the developmental program for the 1981-1985 period calls for a high growth rate of 2.3-2.4 times for computer equipment, maintaining this sector of Romanian industry at the highest quotas, those specified for the peak sectors. The computer industry will provide for the entire domestic requirement for systems and equipment, a constantly growing export trade, rapid modernization of the computer systems in step with their worldwide evolution, increased production of distributed and long-distance data processing systems, and preparation of all the necessary basic and applied programs.

Automation Prospects

Bucharest STIINTA SI TEHNICA in Romanian No 7, Jul 80 p 2

[Article by Eng A. Predoi, director of the Scientific Research and Technological Engineering Institute for Automation, Computer Technology and Telecommunications: "Progress and Prospects of Automation"]

[Text] On the threshold of the spirited effort to acheive the objectives of Romania's socioeconomic development in the 1981-1985 Five-Year Plan and the long-range objectives up to 1990 (a period defined as "the decade of science, technology, quality and effectiveness") and at the crossroads with the accomplishments and fulfillments of the 1976-1980 Five-Year Plan ("the Five-Year Plan of the scientific-technical revolution"), our institute is reviewing 20 years of activity in automation, the 20 years since the word and deed "automation" were inscribed for the first time in the history of Romanian industry on the pediment of heat engineering.

The review of the 20-year period in the service of automation combines the picture of the events in the Romanian people's social progress with the steps on the vertical of the events in the electrotechnical and electronics industry and the stages of the constantly rising "generations" of the industry producing automation elements, equipment and installations, products of Romanian thought and efforts in the human and sometimes superhuman conflict between necessity and reality.

After the Automatica Enterprise with an output of several million lei in 1961 and reaching tens of millions of lei a year in 1965, when imports were over 52 percent, new units (Bucharest FEA [Factory for Automation Elements], Bucharest Electrotehnica, Birlad IEPAM [expansion unknown] and Bucharest FCE [expansion unknown]) appeared with products of a new "generation" of automation and electronics compatible with the process computers of the Felix, Independent and Coral generation, peak creations of Romanian computer technology and products whose value in 1980 will be over 90 times greater than in 1965 and will meet over 92 percent of the domestic requirement.

Passing through the "generations" characterized by the components used, the automation means have developed since 1965, proceeding directly to the second generation and reaching generation 3.5 in the present period. In this succession of generations, scientific research, technological development, and introduction of technical progress were combined with systematization, specialization and typification of the elements, equipment and systems and with applications to industrial equipment and installations in continuous and successive, slow and rapid processes in all sectors of the national economy. Accordingly in the acknowledged present period of computers, directly characterized by the impact of microelectronics and the aggressive penetration of microprocessors, the introduction of overall automations has presupposed and required intensified automation, centralized control, and long-distance data transmission and processing through the introduction of process computers.

The new and modernized products in the automation field assimilated in this five-year plan amount to 55 percent of the value of the output as compared with the 40 percent planned for industry as a whole.

Assimilation of the new products and the modernizations were effected 90 percent through Romanian designs and technical and technological solutions on the current level of technology in general, using semiconductor components of medium density and integrated on a wide scale, as well as microprocessors and subassemblies that led to the creation of elements and equipment in generation 3.5, in compact, miniaturized design and with low internal energy inputs. These do not require air conditioning for their installation or operation, which simplifies constructions and lowers the outlays for investments, maintenance and operation. Design of these elements and devices led to production of unified and standardized systems and subsystems compatible with similar products of foreign firms, namely the SEROM system (95 basic types) for processes in chemistry, energy, and metallurgy, the variators and transformers system (over 170 basic elements) for operations in metallurgy (in rolling mills) and machine building (machine tools), the NC and CNC systems of the NUMEROM type (over 35 basic types) for control of machine tools and metallurgical equipment, the USILOG I, USILOG E, SENTAL S and SENTAL I static commutation systems for electronic devices for automatic control of some processes and assemblies in chemistry, metallurgy, machine building and power engineering, the systems for control of the processes with computers of the FELIX C-32 P and ECAROM, INDEPENDENT-100 and CORAL families for production lines in chemistry, power engineering, machine building and the construction materials industry (cement factories), and the TELEROM system (comprising 24 basic types) for long-distance data transmission and processing.

In the electronics-electrotechnical sector, a proportion of over 10 percent is specified for automation means, with an increase in the contribution of Romanian research to 75-80 percent in the 1985 period and the 1990-2000 horizon.

The main directions and objectives of research and development that will ensure approximation to the level of the developed countries and alignment with the medium countries are wide-scale introduction of microprocessors and other electronic components developed so as to produce a major gain in the performance-cost ratio, improvement of quality in order to enhance reliability through treatment of the program problem of the production flow and the computerized facilities for automatic testing, and forecasting of new unconventional systems of automation applications. The latter include man-computer dialogue systems, automatic systems with self-diagnosis, automation and data transmission systems with lasers and optic fibers, automation systems for exploiting new energy sources (nuclear, solar, wind, maritime and geothermal, and automation systems to increase productivity of extraction, transport and storage equipment and that of the drilling fields for petroleum and gases.

Moreover, introduction of new and modernized manufacturing processes like those for making multilayered interwoven cabling(manufacturing cycle shortened by at least 40 percent), flexible cabling (material inputs reduced 50 percent), flexible flat cabling with self-support (productivity increased by 50 percent and heat welding processes completely eliminated) and transmission of signals through optic fibers (consumption of copper and electric power reduced by 70 percent), and the control systems with stationary buttons and switches instead of the electromechanical ones will make it possible to double the output volume in 1985 with material and energy inputs averaging 50 percent less and about 60-65 percent more manpower than in 1980.

The program for research, technological engineering and production of automation means, which is based on the above-mentioned directions, objectives and elements of economic effectiveness, is correlated with the other programs of the Ministry of the Machine Building Industry (machine tools and equipment and metallurgical and power engineering construction materials for the light and food industry), and it is estimated that it will meet the domestic requirement by 1985, while the expected levels of automation according to ministries and industrial sectors will reach figures comparable to those of the developed countries.

Moreover in the 1981-1985 period emphasis will be placed upon standardization of compact, miniaturised solutions with reduced energy inputs, providing for complete integration of automation and computer equipment in the technological assemblies and devices of the systems of machines and equipment standardized for the technologies in the main industrial sectors (metallurgical, chemical, machine building, construction materials, power engineering and other industries) and that of the special programs of vital importance (energy, nuclear, marine drilling, mining, transportation and other programs).

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SWINE BRUCELLOSIS TO BE ERADICATED BY THE END OF 1980

Bucharest REVISTA DE CRESTEREA ANIMALELOR in Romanian No 6,
Jun 80 pp 30-31

[Article by Dr. I. Predoiu, Institute for Veterinary Research and Biological Preparations, and Dr. N. Visarion, Veterinary Health Directorate of the Ministry of Agriculture and Food Industry].

[Text] The current methods of industrial-scale swine husbandry require that the animals of the units be free of any kind of disease.

Raising animals while operating in large, specialized enterprises started several years ago in Romania pointed out the disadvantages caused by the existence of brucellosis, an infection which renders very difficult the process of upgrading from the viewpoint of management, raising, protective measures and profit making.

In order to accelerate the rate of benefication of the land, the known means of combatting the disease were studied and analyzed, adopting original solutions which suit the domestic methods of swine husbandry.

The conventional methods which were considered or adopted throughout the world were listed and checked; this made it possible to rank them and to select the principle for our own studies. The history of the fight against this disease yielded several methods which were used but subsequent experience has proven most of them to be ineffectual.

The many experiments to find an active biopreparation for specific prevention remained unsuccessful. Killed or live vaccines alone or in association with immunostimulating adjuvants, did not provide a satisfactory protection, so that at present, no vaccination of the swine is practiced anywhere in the world.

As far as therapy is concerned, the many investigations for treating humans revealed the "in vitro" sensitivity of Brucella to various antibiotics; however, because of the habitat of the germ, a curing dose in vivo results only in a bacteriostatic effect without a sterilization of the organism. In view of these findings in more of the countries, are the animals of consumption treated because the methods are ineffective, expensive and result in restrictions for using the meat as food.

In view of the fact that vaccination and treatment were found to be ineffective, the fight against the disease forced most of the countries with well-established animal raising industry to turn to administrative methods and to measures of veterinary hygiene, based on the principle of the improvement of the sanitation in the infected farms and the protection of those which have not yet been affected.

Two paths were followed on how to improve the sanitary conditions of the farms:

(a) removal of animals found to be suffering from brucellosis, as detected by repeated checkup tests, in conjunction with disinfection and other hygienic measures;

(b) sacrificing the whole herd and starting anew with healthy stock.

The first, obviously more economical formula, did not eradicate the disease in the units. Young animals, or carriers, which did not exhibit any reaction in the diagnostic tests, passed on the infection to the subsequent generations. The method that was found to be the most efficient and less expensive, as checked in many cases, was the slaughtering of all animals, taking disinfection measures, followed by a waiting period and introducing healthy animals.

As far as the diagnosis of swine brucellosis is concerned, it is well known that it presents problems, especially at the preclinical stage, because of certain species-specific features in the behavior.

It was found that in young animals, the tests based on a complex examination have a clearly limited usefulness.

The presence, or the absence of infection at a farm may be verified in general on the basis of the following elements:

- epizootic investigation, covering the last one to three years; emphasizing the examination of possible contacts with the outside, or the importation of animals from the outside;

- clinical data - abortions or other reproduction disturbances, orchitis, chronic mastitis, arthritis, abcesses, locomotary disturbances (suspicious situation);

- serological examination by RAL and RFC, carried out with selected samples using an adequate technical accuracy;

- allergic reaction, especially with mature or old animals;

- bacteriological examination of the abortion products or of other pathological material (decisive response).

A comparison of the results of the above methods, and in case of uncertainty, repetition of some of the tests, allows to confirm or exclude the infection. It should be kept in mind that treatment with antibiotics during the final period of gestation, may prevent proving the presence of the causative agent in cultures or in direct smears; similarly, the serological examination in swine represents the effective diagnosis, and a corroboration of the partial agglutination data with the complement fixation results checked systematically, raises the confidence level.

Reaching a diagnosis is of decisive importance because it is the starting point of a series of sanitary measures.

During thelast decade, great progress has been made in Romania in lowering the incidence of diseases in swine.

The high-priority goals of the national program for the development of animal raising industry and for increasing the animal production include the eradication of this diseases from the farms by the end of the 1980s.

The plan developed for this purpose was based on certain conditions which favor a cooperative effort, carried out in the following manner:

- production rates in agriculture and animal husbandry were increased, together with the number of qualified professionals; this provided the needed material and technical infrastructure;

- the creation of a network of veterinary health institutes and laboratories based on the counties facilitated the execution of preventive, diagnostic and counteracting measures within each of the areas, including the properties of the state and cooperatives and individually owned ones;

- the level of equipping the farms with needed public services was further raised; these services included the mechanization of certain operations, running water, sewers, fencing, tools, large disinfecting units, etc.

The adopted principle of counterattack consisted of the improvement of the sanitation at the infected farms and protecting the affected animals; the activity was organized according to the administrative territorial units of the county.

The first stage involved the creation of a map which indicated the distribution of the disease in the country. In the counties in which the infection was found to be present, the healthy or infected state of each unit was determined on the basis of a complex set of examinations, clarifying the situation and simultaneously classifying the farms into one of the above two categories, or as insufficiently known ones. Depending on the size and quality of the stock, a ranking urgency for sanitation measures was developed, both for the counties and for the units within the counties. Enterprises which were known to be unaffected and able to supply breeding stock, were so certified.

The sanitation measure consisted in stamping out. All breeding was stopped, then the whole stock was sacrificed; sanitation measures (DDD) and retooling were carried out and the farms were modernized followed by repopulating the heard with healthy breeding stock. As the number of large farming complexes increased, the total replacement with breeding animals was carried out without difficulty.

In order to eliminate all possible external sources of infection, compulsory control measures were introduced also at the privately owned pig farms, checking the breeding activity in this sector.

Every year measures of veterinary sanitation, check-up, quarantine and circulation control were developed on the basis of the technical plan; they helped to eradicate the centers of contagion.

The factual proofs of the advantages resulting from the beneficiation the direct technical communications and journal articles helped to promote the sanitation process.

The stated goal, that swine brucellosis in the farms will be eradicated by the end of 1980, is about to be reached.

The fact that there are still certain farms with a previous history of the disease in some of the counties does attract the attention of the central and county officials, and required sanitary measures will be undertaken as soon as the local economic conditions allow it.

The stage that has been reached is the result of the excellent cooperation between the professionals and the leadership involved in this effort.

The researchers brought together and made available the scientific information which included the best approach to solve the problem; specialists at various levels of expertise adapted, coordinated and simplified them, the laboratory personnel took care of the diagnosis, leaving the staff of the farming units and the county network in charge of the operation. The role of the central and district officials, who adopted the proposed program and assisted in carrying it out, should be pointed out.

At the present phase when the process of freeing the farms from this disease is about to be completed, certain facts learned from the experience should be emphasized.

There is still potential for disease which could contaminate again the farms; it could start in individually owned pig farms, which may not be under veterinary control, or in certain wild animals, especially the wild rabbit, other members of the rodent family which carry and transmit the pathogenic agents, by passing through the border.

Certain outbreaks during recent years in healthy farms have proven that all this is still a real danger.

The large, ever-increasing number of big farms points to the high responsibility to keep them healthy, knowing fully well that the only solution is slaughtering of animals.

This justifies the strict protective measures and the professional vigilance, established in these large farms.

The supervisory provisions of the action plan must be carried out in totality together with the instructions and regulations issued to cover the special environment. These rules are applicable for a long time after the last case has been identified.

The continued need for control and check-ups is, furthermore, due to the fact that we are one of the large producing countries of this type of meat. We are among the fastest growing industrial units, thus, as the rate of import-export activity increases, there are many new means to introduce the germ by means of vehicles.

The close connection between the professional, technological contributions and the leadership, and the experience gained, guarantees that the fight against swine brucellosis will end with the expected result.

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